

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

WASTEWATER TREATMENT STRIP

(Ac.)

CODE 635

DEFINITION

A treatment component of an agricultural waste management system consisting of a strip or area of herbaceous vegetation.

PURPOSE

The purpose of this practice is to improve water quality by reducing loading of nutrients, organics, pathogens, and other contaminants associated with animal manure and other wastes, and wastewater by treating agricultural wastewater and runoff from livestock holding areas with:

- rapid infiltration,
- overland flow, or
- the slow rate process

CONDITIONS WHERE PRACTICE APPLIES

This practice applies:

- where a treatment strip is a component of a planned agricultural waste management system
- where a treatment strip can be constructed, operated and maintained without polluting air or water resources
- to the treatment of contaminated runoff from such areas as feedlots, barnyards, and other livestock holding areas
- to the treatment of dilute wastewater such as milk house effluent and diluted silage leachate

CRITERIA

General Criteria Applicable To All Purposes

The installation and operation of the wastewater treatment strip shall comply with all federal, state, and local laws, rules, and regulations. The Alabama Department of Environmental Management (ADEM) Rules require owners/operators of animal feeding operations (AFO's) and associated waste management systems to fully implement and regularly maintain effective best management practices (BMP's) that meet or exceed NRCS technical standards and guidelines to prevent discharges and to ensure groundwater and surface water quality.

All construction activities must implement adequate construction stormwater management BMP's. In addition, to comply with the National Pollutant Discharge Elimination System (NPDES) Phase II Rule, all construction activities involving one acre or more of land disturbance shall have and follow a construction best management practices plan (CBMPP) until construction is complete and all disturbed areas are stabilized.

ADEM AFO/CAFO rules require that operators retain records documenting that (1) all designs and plans for any structures were prepared and certified by a professional engineer registered in the State of Alabama (PE), (2) construction was supervised by a PE, and (3) once construction was completed, a PE certified that the completed facility was constructed in accordance with the approved plans and met or exceeded good engineering

practices and NRCS technical standards and guidelines, and (4) any modifications or repairs made to the structures were supervised and certified by a PE.

ADEM has a zero discharge rule for animal wastes. No discharge of wastewater or contaminated runoff from the wastewater filter strip to groundwater or to a stream or water of the state will be permitted. Transfer discharges of wastewater and contaminated runoff from the treatment strip to a waste storage facility, a waste treatment lagoon, or other facility for further treatment and/or utilization.

Ground disturbing activities such as excavation and site preparation for animal waste facilities and pipelines have the potential to affect significant cultural resources. Complete a cultural resources review prior to ground disturbing activities to assure that existing cultural resources will not be adversely impacted.

Pretreat inflow to wastewater treatment strip as appropriate.

Do not apply wastewater to treatment strip when soil is saturated or during periods when vegetation is not actively growing.

Design discharge to and through treatment strip as sheet flow. Provide some means, such as a ditch, curb, or gated pipe, to disperse concentrated flow and ensure sheet flow across the width (dimension perpendicular to flow length) of the treatment strip. Provide land grading and structural components necessary to maintain sheet flow throughout the length (dimension parallel to the flow) of the treatment strip as necessary.

Establish permanent herbaceous vegetation in the treatment strip consisting of a single species or a mixture of grasses, legumes, and/or other forbs adapted to the soil and climate. Minimum acceptable stem density is one stem per square inch. Select vegetation that will be able to withstand anticipated wetting and/or submerged conditions.

Divert clean water from the treatment strip to the fullest extent possible unless needed to promote vegetative growth in the treatment strip.

If site restrictions require location within a floodplain, protect the treatment strip from inundation or damage from a 100-year flood event.

Base designs on the latest edition of the Environmental Protection Agency "Process Design Manual: Land Treatment of Municipal Wastewater" or other technically acceptable reference.

Additional Criteria For Rapid Infiltration Treatment

Rapid infiltration treatment refers to a specific remediation technique that utilizes the filtering capabilities of moderately and highly permeable soils. Treatment for this purpose shall consist of directing wastewater or contaminated runoff from a livestock holding area into a uniformly graded strip or area of herbaceous vegetation and allowing it to flow over and infiltrate the treatment strip. This method is not appropriate for treatment of wastewater containing high concentrations of nutrients.

Pretreat contaminated runoff by solid/liquid separation utilizing a facility such as a settling basin prior to discharge of liquid to the treatment strip.

Grade the treatment strip to be a uniform strip or wide bottomed trapezoidal channel.

Base the treatment strip design on the runoff volume from the 25-year, 24-hour storm event from the livestock holding facility. It may be designed to infiltrate a portion or the entire volume of the design storm. This determination will be based on management objectives. Transfer the portion of the design volume not infiltrated to a storage facility.

Base the treatment strip's area requirement on the soil's capacity to infiltrate and retain runoff within the root zone and the vegetation's capability to utilize the nutrient loading. Base the soil's ability to infiltrate and retain runoff on its water holding capacity in the root zone, infiltration rate, permeability, and hydraulic conductivity. Base this determination on the most restrictive soil layer within the root zone regardless of its thickness. The anticipated nutrient loading shall not exceed the vegetation's agronomic nutrient requirement.

Design the infiltration strip so that the upper soil profile remains unsaturated except during storm events and returns to an unsaturated condition within two days following storm events. The water table shall be either naturally deep enough or artificially lowered so that the infiltrated runoff does not mingle with the native ground water. Do not plan infiltration strip where soil features such as cracking will result in preferential flow paths that transport untreated runoff from the surface to below the root zone.

Additional Criteria For Overland Flow Treatment

Overland flow treatment refers to a specific microbial remediation technique that has minimal infiltration of wastewater. Treatment by overland flow shall consist of the application of wastewater along the upper portion of a uniformly sloped strip of herbaceous vegetation, allowing it to flow over the vegetated surface for aerobic treatment.

Select the design hydraulic loading rate and application rate based on consideration of the anticipated levels of pretreatment, quality of effluent, temperature, and other climatic conditions. Use a maximum hydraulic loading rate of 2.0 inches per day and an application rate of eight gallons per hour per foot of slope width unless higher rates can be justified by on-site studies.

The application period shall not exceed 12 hours per day and the application frequency not exceed 5 days per week unless longer application periods and frequencies can be justified based on local conditions.

The nutrients anticipated to infiltrate the treatment strip shall not exceed the vegetation's agronomic nutrient requirement.

Construct overland flow treatment on soils with low permeability. Base the design on the most restrictive soil layer within the root zone. The maximum allowable permeability shall be 0.2 inches per hour unless a natural or constructed barrier within the soil profile mitigates the potential of ground water contamination.

The minimum slope length for the applied wastewater shall be 100 feet.

Uniformly grade the sloped areas to receive wastewater to eliminate wastewater ponding and short-circuiting for the length of the flow. Slopes shall be equal to or greater than 2.0% but shall not exceed 8.0%.

Additional Criteria For Treating Wastewater With The Slow Rate Process

The slow rate process refers to a specific remediation technique involving the application of wastewater to a vegetated surface for treatment as it flows down through the plant-soil matrix.

Base the design hydraulic loading on the more restrictive of two limiting conditions – the capacity of the soil profile to transmit water (soil permeability) or the nitrogen concentration in the water percolating below the root zone. The percolate nitrate-nitrogen concentration leaving the root zone shall not exceed 10 mg/L. The anticipated nutrient loading shall not exceed the vegetation's agronomic nutrient requirement.

Provide storage when the amount of available wastewater exceeds the design hydraulic loading rate or for strip non-operating periods.

Apply wastewater to the treatment strip utilizing a method that will result in an even application of the entire strip and a rate that does not exceed the infiltration rate of the soil.

CONSIDERATIONS

Treatment strip should be located outside of floodplains when possible.

Provide more than one overland flow treatment strip to allow for resting, harvesting vegetation, maintenance, and to minimize the potential for overloading.

Organic loading, odor generation, and maintenance requirements can be reduced by pretreating overland flow influent with solid/liquid separation.

When weather conditions are not favorable for aerobic activity or when soil temperatures are lower than 39° F, application to treatment strip should be suspended.

Consider reducing the application rate and increasing the application period while

maintaining the hydraulic loading rate constant when soil temperatures are between 39° F and 50° F.

Uncovered areas can deliver large quantities of wastewater contaminated runoff to a treatment strip. Consider diverting all runoff directly to a waste storage or treatment facility.

PLANS AND SPECIFICATIONS

Prepare plans and specifications in accordance with the criteria of this standard that describe the requirements for applying the practice to achieve its intended use. Plans should include information about the location, construction sequence, and vegetation establishment.

Specifications will include:

- length, width, and slope of the treatment strip to accomplish the planned purpose (length refers to flow length down the slope of the treatment strip)
- herbaceous species and seed selection and rates to accomplish the planned purpose
- planting dates, care, and handling of the seed to ensure that planted materials have an acceptable rate of survival
- statement that only viable, certified weed free, high quality, and regionally adapted seed will be used
- site preparation sufficient to establish and grow selected species

OPERATION AND MAINTENANCE

Develop an operation and maintenance plan that is consistent with the purposes of the practice, its intended life, safety requirements, and the criteria for its design. The plan shall include the following activities as appropriate:

- harvest treatment strip vegetation as appropriate to encourage dense growth, maintain an upright growth habit, and remove nutrients and other contaminants that are contained in the plant tissue

- control undesired weed species, especially state-listed noxious weeds
- inspect treatment strip periodically and after storm events and repair gullies, remove flow disrupting sediment accumulation, restore vegetation, or take other measures as needed to prevent concentrated flow
- apply supplemental nutrients as needed to maintain the desired species composition and stand density of herbaceous vegetation
- maintain or restore the treatment strip as necessary by periodically grading when deposition jeopardizes its function, and then reestablishing to herbaceous vegetation
- routinely de-thatch and/or aerate treatment strip used for treating runoff from livestock holding areas in order to promote infiltration
- conduct maintenance activities only when moisture content in surface soil layer will resist compaction
- prevent grazing in treatment strip

A treatment strip in arid or semiarid regions that potentially could be affected by high salinity and/or sodicity (sodium content) should be monitored for excessive salt and sodium buildup and appropriate corrective action taken if necessary.

REFERENCES

- ADEM Administrative Code
[AFO/CAFO Rule, Chapter 335-6-7, as amended](#)
[Construction Stormwater Rule, Chapter 335-6-12, as amended](#)
- Environmental Protection Agency, "Process Design Manual: Land Treatment of Municipal Wastewater"
- NRCS Cultural Resources Handbook